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DEPARTMENT OF THE ARMY **02550.TD**
CORPS OF ENGINEERS, TULSA DISTRICT **FEB 97**

TULSA DISTRICT GUIDE SPECIFICATION

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SECTION 02550

BITUMINOUS SURFACE COURSE (LESS THAN 1000 TON)

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NOTE: This Guide is to be used for less than 1000 tons of surface course in Oklahoma and Texas

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1 GENERAL

1.1 GENERAL REQUIREMENTS

Specifications requirements herein refer to applicable State Standard Specifcations for Bituminous Surface Course. Where specifications differ between state standards and requirements stated herein, the state standards shall prevail unless otherwise specifically stated herein that the state standards are not applicable.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

OKLAHOMA DEPARTMENT OF TRANSPORTATION (ODOT)

ODOT Standard Specifications for Highway Construction, Edition of 1988 with 1991 Supplement

TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION (TSDHPT)

TSDHPT Standard Specifications for Construction of Highways, Streets and Bridges, 1982

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 117 (1990) Materials Finer than 75 um (No. 200) Sieve in Mineral Aggregates by Washing

ASTM C 127 (1988) Specific Gravity and Absorption of Coarse Aggregate

ASTM C 128 (1988) Specific Gravity and Absorption of Fine Aggregate

ASTM C 136 (1984;Rev A) Sieve Analysis of Fine and Coarse Aggregates

ASTM C 183 (1988) Sampling and Acceptance of Hydraulic Cement

ASTM D 75	(1987) Sampling Aggregates
ASTM D 140	(1988) Sampling Bituminous Materials
ASTM D 2041	(1991) Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures
ASTM D 2172	(1992) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

CORPS OF ENGINEERS (COE)

COE Handbook for Concrete and Cement

Order from:

U.S. Army Engineer Waterways Experiment Station
ATTN: Technical Report Distribution Section, Services Branch, TIC
3909 Halls Ferry Rd.
Vicksburg, MS 39180-6199
Ph: 601-634-2355
Fax: 601-634-2506

CRD-C 649	(1995)Standard Test Method for Unit Weight, Marshall Stability, and Flow of Bituminous Mixtures
CRD-C 650	(1995) Standard Method for Density and Percent Voids of Compacted Bituminous Paving Mixtures
CRD-C 652	(1995) Standard Test Method for Measurement of Reduction in Marshall Stability of Bituminous Mixtures Caused by Immersion in Water

1.3 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.3.1 General

The bituminous plant shall be of such capacity to produce the quantities of bituminous mixtures required. Hauling equipment, paving machines, rollers, miscellaneous equipment, and tools shall be provided in sufficient numbers and capacity and in proper working condition to place the bituminous paving mixtures at a rate equal to the plant output.

1.3.2 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 3.66 m 12-foot straightedge for each bituminous paver. Straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

1.4 WEATHER LIMITATIONS

Unless otherwise directed, bituminous courses shall not be constructed when temperature of the surface of the existing pavement or base course is below 4 degrees C 40 degrees F.

1.5 PROTECTION OF PAVEMENT

After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until the pavement has cooled to 60 degrees C 140 degrees F.

1.6 GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS

Finished surface of bituminous courses, when tested as specified below shall conform to gradeline and elevations shown and to surface-smoothness requirements specified.

1.6.1 Plan Grade

The grade of the completed surface shall not deviate more than 15 mm 0.05 foot from the plan grade.

1.6.2 Surface Smoothness

When a 3.66 mm 12-foot straightedge is laid on the surface, the surface shall not vary more than 6 mm 1/4 inch from the straightedge.

1.7 GRADE CONTROL

Lines and grades shall be established and maintained by means of line and grade stakes placed at site of work. Elevations of bench marks used by the Contractor for controlling pavement operations at the site of work will be determined, established, and maintained by the Government. Finished pavement elevations shall be established and controlled at the site of work by the Contractor in accordance with bench mark elevations furnished by the Contracting Officer.

1.8 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Unless otherwise specified, sampling shall be in accordance with ASTM D 75 for aggregates, ASTM C 183 for mineral filler, and ASTM D 140 for bituminous material. Copies of test results shall be furnished to the Contracting Officer. Approval of a source does not relieve the Contractor of responsibility for delivery at the job site of materials meeting the requirements herein. Required tests, test frequencies of test standards shall be as follows:

1.8.1 Hot bin gradations (cold-feed gradation when drum mix plant is used):

One test per 400 metric tons tons of mix or fraction thereof. ASTM C 136 and ASTM C 117.

1.8.2 Stability Specimens

Two sets (three specimens per set) per day and/or at least one set per each 400 metric tons tons of mix placed. See Paragraph: "Test Properties of Bituminous Mixtures" for test standards.

1.8.3 Asphalt Extraction

One test per 400 metric tons tons of mix (at least one per day). See Paragraph: "Test Properties of Bituminous Mixture" for test standards.

1.8.4 Field and Lab Density Tests

One lab density and one field density set per 400 metric tons tons of mix or fraction thereof (three specimens per set). CRD-C 650 (field test), CRD-C 649 (lab test).

1.8.5 Thickness Measurements

One measurement for each 850 square meters 1000 square yards.

1.9 ACCESS TO PLANT AND EQUIPMENT

The Contracting Officer shall have access at all times to all parts of the paving plant for checking adequacy of the equipment in use, inspecting operation of the plant, verifying weights, proportions, and character of materials, and checking temperatures maintained in preparation of the mixtures.

2 PRODUCTS

2.1 HOT-MIX SURFACE COURSE

Bituminous hot-mix surface course shall conform to the requirements of the [ODOT Standard Specifications for Highway Construction for Plant Mix Asphalt Concrete Pavement Section 411 and 411A] [TSDHPT Standard Specifications for "Hot-Mix Asphaltic Concrete Pavement"], except as specified hereinafter.

2.1.1 Asphalt Material

Asphalt material for the surface course shall be asphalt cement, [Type AC-20, conforming to ODOT Standard Specification for "Asphalt Materials", Section 708.03] [AC-10 conforming to TSDHPT Standard Specification for "Asphalts, Oils, and Emulsions" Item 300]. Asphalt material shall come from a source approved for use by the [Oklahoma Department of Transportation] [Texas Highway Department]. The seal number from the tank and the number of the [Oklahoma Department of Transpostation's] [Texas Highway Department's] Laboratory test report shall be furnished to the Contracting Officer.

2.1.2 Paving Mixture Type

Paving mixture shall be Type ["C"](Oklahoma) ["D"](Texas).

2.1.3 Modifications to State Standard Specifications

[ODOT] [TSDHPT] Specifications shall be modified as follows:

(a) Construction methods paragraph shall not apply.

(b) The measurement and payment paragraphs shall not apply

[(d) Material retained on the No. 10 screen shall not exceed 65 percent.] (Texas only)

2.2 PROPORTIONING OF MIXTURE

2.2.1 Job Mix Formula(JMF)

No bituminous mixture shall be manufactured until the grading and asphalt content of the proposed mix has been furnished by the plant for the Contracting Officer's approval. The formula will indicate the percentage of each sieve fraction of aggregate, percentage of asphalt, and temperature of the completed mixture when discharged from the mixer. The job-mix formula will be allowed the tolerances specified in the [ODOT Standard Specification, Section 411 and 411A] [TSDHPT Standard Specification, Item 340]. The bitumen content and aggregate gradation may be adjusted within the limits of the gradation tables specified therein to improve the paving mixtures, as directed, without adjustments in the contract price. The percentages of each sieve fraction in the job-mix formula will be restricted to values such that the applicable of the specified tolerances will not cause the limits of the gradation tables to be exceeded.

2.2.2 Test Properties of Bituminous Mixtures

Finished mixture shall meet requirements described below when tested in accordance with CRD-C 650 except extraction and recovery of asphalt cement shall be in accordance with ASTM D 2172. All samples shall be compacted with 50 blows of specified hammer on each side of sample. When bituminous mixture fails to meet the requirements specified below, the paving operation shall be stopped until the cause of noncompliance is determined and corrected.

2.2.2.1 Stability, Flow, and Voids

Requirements for stability, flow, and voids are shown in Tables I and II for nonabsorptive and absorptive aggregates, respectively.

TABLE I. NONABSORPTIVE-AGGREGATE MIXTURE

Stability minimum, newtons	2200
Flow maximum, 25/100-millimeter units	20
Voids total mix, percent (1)	3-5
Voids filled with bitumen, percent (2)	75-85

TABLE I. NONABSORPTIVE-AGGREGATE MIXTURE

	Surface Course
Stability minimum, pounds	500
Flow maximum, 1/100-inch units	20
Voids total mix, percent (1)	3-5
Voids filled with bitumen, percent	75-85

(1) The Contracting Officer may permit deviations from limits specified when gyratory method of design is used to develop the JMF.

TABLE II. ABSORPTIVE-AGGREGATE MIXTURE

Stability minimum, newtons	2200
Flow maximum, 25/100-millimeter units	20
Voids total mix, percent (1)	2-4
Voids filled with bitumen, percent (2)	80-90

TABLE II. ABSORPTIVE-AGGREGATE MIXTURE

Surface Course

Stability minimum, pounds	500
Flow maximum, 1/100-inch units	20
Voids total mix, percent (1)	2-4
Voids filled with bitumen, percent	80-90

(1) The Contracting Officer may permit deviations from limits specified when gyratory method of design is used to develop the JMF.

a. When the water-absorption value of the entire blend of aggregate does not exceed 2.5 percent as determined in accordance with ASTM C 127 and ASTM C 128, the aggregate is designated as nonabsorptive. The theoretical specific gravity computed from the apparent specific gravity or ASTM D 2041 will be used in computing voids total mix and voids filled with bitumen, and the mixture shall meet requirements in Table I.

b. When the water-absorption value of the entire blend of aggregate exceeds 2.5 percent as determined in accordance with ASTM C 127 and ASTM C 128, the aggregate is designated as absorptive. The theoretical specific gravity computed from the bulk-impregnated specific gravity method contained in ASTM D 2041 shall be used in computing percentages of voids total mix and voids filled with bitumen. The mixture shall meet requirements in Table II.

2.2.2.2 Index of Retained Stability

The index of retained stability shall be greater than 75 percent as determined by CRD-C 652. When the index of retained stability is less than 75, the aggregate stripping tendencies may be corrected by the use of hydrated lime or by treating the bitumen with an approved antistripping agent. The hydrated lime shall be considered as mineral filler and included in the gradation. The amount of hydrated lime or antistripping agent added to bitumen shall be sufficient, as approved, to produce an index of retained stability of not less than 75 percent. No additional payment will be made to the Contractor for addition of antistripping agent required.

3 EXECUTION

3.1 BASE COURSE CONDITIONING

The surface of the base course will be inspected for adequate compaction and surface tolerances specified in Section 02241 AGGREGATE BASE COURSE. Unsatisfactory areas shall be corrected.

3.2 STORAGE OF BITUMINOUS PAVING MIXTURE

Storage shall conform to the applicable requirements of ASTM D 3515; however, in no case shall the mixture be stored for more than 4 hours.

3.3 TRANSPORTATION OF BITUMINOUS MIXTURE

Transportation from paving plant to site shall be in trucks having tight, clean, smooth beds lightly coated with an approved releasing agent to prevent adhesion of the mixture to the truck bodies. Excessive releasing agent shall be drained prior to loading. Each load shall be covered with canvas or other approved material of ample size to protect mixture from weather and prevent loss of heat. Loads that have crusts of cold,

unworkable material or that have become wet will be rejected. Hauling over freshly placed material will not be permitted.

3.4 SURFACE PREPARATION OF UNDERLYING COURSE

Prior to placing of the intermediate or wearing course, the underlying course shall be cleaned of all foreign or objectionable matter with power brooms and hand brooms.

3.5 PRIME COATING

Surfaces of previously constructed base course shall be sprayed with a coat of bituminous material in accordance with Section 02559 BITUMINOUS PRIME COAT.

3.6 PLACING

Bituminous courses shall be constructed only when the base course or existing pavement has no free water on the surface. Bituminous mixtures shall not be placed without ample time to complete spreading and rolling during daylight hours, unless approved satisfactory artificial lighting is provided.

3.6.1 Offsetting Joints

The surface course shall be placed so that longitudinal joints of the top course will be offset from joints in the underlying course by at least 300 mm 1 foot. Transverse joints in the surface course shall be offset by at least 600 mm 2 feet from transverse joints in the underlying course.

3.6.2 General Requirements for Use of Mechanical Spreader

Range of temperatures of mixtures, when dumped into the mechanical spreader, shall be as determined by the Contracting Officer. Mixtures having temperatures less than 107 degrees C 225 degrees F when dumped into the mechanical spreader shall not be used. The mechanical spreader shall be adjusted and the speed regulated so that the surface of the course being laid will be smooth and continuous without tears and pulls, and of such depth that, when compacted, the surface will conform to the cross section indicated. Placing with respect to centerline areas with crowned sections or high side of areas with one-way slope shall be as directed. Placing of the mixture shall be as nearly continuous as possible, and speed of placing shall be adjusted, as directed, to permit proper rolling. When segregation occurs in the mixture during placing, the spreading operation shall be suspended until the cause is determined and corrected.

3.6.3 Placing Strips Succeeding Initial Strips

In placing each succeeding strip after initial strip has been spread and compacted as specified below, the screed of the mechanical spreader shall overlap the previously placed strip 50 to 75 mm 2 to 3 inches and be sufficiently high so that compaction produces a smooth dense joint. Mixture placed on the edge of a previously placed strip by the mechanical spreader shall be pushed back to the edge of the strip by use of a lute. Excess mixture shall be removed and wasted.

3.6.4 Handspreading in Lieu of Machine Spreading

In areas where the use of machine spreading is impractical, the mixture shall be spread by hand. Spreading shall be in a manner to prevent

segregation. The mixture shall be spread uniformly with hot rakes in a loose layer of thickness that, when compacted, will conform to required grade, density, and thickness.

3.7 COMPACTION OF MIXTURE

Rolling shall begin as soon after placing as the mixture will bear a roller without undue displacement. Delays in rolling freshly spread mixture will not be permitted. After initial rolling, preliminary tests of grade and smoothness shall be made by the Contractor. Deficiencies shall be corrected so that the finished course will conform to requirements for grade and smoothness specified herein. After the Contractor is assured of meeting crown, grade, and smoothness requirements, rolling shall be continued until a mat density of 97.0 to 100.0 percent and a joint density of 95.0 to 100.0 percent of density of laboratory-compacted specimens of the same mixture is obtained. Places inaccessible to rollers shall be thoroughly compacted with hot hand tampers.

3.8 CORRECTING DEFICIENT AREAS

Mixtures that become contaminated or are defective shall be removed to the full thickness of the course. Edges of the area to be removed shall be cut so that sides are perpendicular and parallel to the direction of traffic and so that the edges are vertical. Edges shall be sprayed with bituminous materials. Fresh paving mixture shall be placed in the excavated areas in sufficient quantity so that the finished surface will conform to grade and smoothness requirements. Paving mixture shall be compacted to the density specified herein. Skin patching of an area that has been rolled will not be permitted.

3.9 JOINTS

3.8.1 General

Joints between old and new pavements, between successive days' work, or joints that have become cold (less than 80 degrees C 175 degrees F) shall be made to insure continuous bond between the old and new sections of the course. All joints shall have the same texture and smoothness as other sections of the course. Contact surfaces of previously constructed pavements coated by dust, sand, or other objectionable material shall be cleaned by brushing or shall be cut back as directed. When directed by the Contracting Officer, the surface against which new material is placed shall be sprayed with a thin, uniform coat of bituminous material. Material shall be applied far enough in advance of placement of a fresh mixture to insure adequate curing. Care shall be taken to prevent damage or contamination of the sprayed surface.

3.8.2 Transverse Joints

The roller shall pass over the unprotected end of a strip of freshly placed material only when placing is discontinued or delivery of the mixture is interrupted to the extent that the material in placed may become cold. In all cases, prior to continuing placement, the edge of previously placed pavement shall be cut back to expose an even vertical surface for full thickness of the course. In continuing placement of a strip, the mechanical spreader shall be positioned on the transverse joint so that sufficient hot mixture will be spread to obtain a joint after rolling that conforms to the required density and smoothness specified herein.

3.8.3 Longitudinal Joints

Edges of a previously placed strip shall be prepared such that the pavement in and immediately adjacent to the joint between this strip and the succeeding strip meets the requirements for grade, smoothness, and density specified.